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ABSTRACT

The concept of industriology is based on the premise that children should be exposed to a comprehensive study of industry in existing industrial arts facilities with selected instructional materials. The concept has four phases, of which this one, The Development and Structure of Industry, is the first. Other phases cover Basic Elements and Processes of Industry, Modern Industries, and Vocational and Occupational Guidance. For each phase, four instructional aids were developed through research and trial testing in high schools, and are still subject to evaluation and revision. This study guide, one of the four aids for this phase, includes studies of the history and development of industry, four general types of industries which make up the industrial complex and six basic activities typical of most industries. Other documents in this series are available as VT 010 313, VT 010 290, and VT 010 315. (CD)

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# STUDY GUIDE

INDUSTRIOLOGY

# DEVELOPMENT AND STRUCTURE OF INDUSTRY

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WISCONSIN STATE UNIVERSITY- PLATTEVILLE

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# DEVELOPMENT AND STRUCTURE
# OF
# INDUSTRY

## STUDY GUIDE

INDUSTRIOLOGY PROJECT

*Subject To Further Research and Revision*

SCHOOL OF INDUSTRY
WISCONSIN STATE UNIVERSITY-PLATTEVILLE

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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# INTRODUCTION

The existence and justification for any industrial arts program today must be based upon sound objectives. One of these objectives is that of providing a broad and comprehensive interpretation and study of industry for children. Nationally conducted studies of existing industrial arts programs in the United States reveal a concentration of subject matter far too narrow in scope to adequately meet the objective cited above. Because of the existing condition revealed through such studies, INDUSTRIOLOGY was conceived and developed as one approach to resolving this condition.

INDUSTRIOLOGY is a concept focused upon the premise that all children should be exposed to a broad and comprehensive study of industry and that such a study is feasible by utilizing any existing industrial arts facility provided the instructor and student are furnished instructional materials to assist them in such a study. From the variety of industrial subject matter content developed through the INDUSTRIOLOGY Concept, any industrial arts instructor could choose those portions of instructional materials which are best adapted to the tools, materials, and equipment that are available in his school.

INDUSTRIOLOGY is not intended to replace industrial arts as a curriculum, but rather to supplement, revise, modify, and upgrade present day industrial arts programs.

The concept of INDUSTRIOLOGY involves a variety of instructional materials centered around industrial subject matter. The content of this material has been organized into four major divisions which are designated as phases.

The phases as they are structured are briefly identified as follows:

Phase I - Development and Structure of Industry

Phase II - Basic Elements and Processes of Industry

Phase III - Modern Industries

Phase IV - Vocational and Occupational Guidance

While it is desirable that Phase I precede or be a prerequisite for the other phases, it is conceivable that the phases could be taught in any order as desired by the instructor.

Ideally, the materials developed for the INDUSTRIOLOGY Concept would be used beginning with the first phase and progressively completing each of the four phases in sequence.

Instructional materials are developed for each of the phases listed above and consist of the following:

1. A Study Guide
2. A Teaching Plan and Activity Sheets
3. Information and Job Assignment Sheets
4. Instructional Aids List and Bibliography

The instructional materials in INDUSTRIOLOGY were developed through research and trial testing in industrial arts programs of several public high schools. This was accomplished through the efforts of graduate fellowship students, staff members in the School of Industry, and an advisory group representing industry. Those utilizing these materials must recognize that such materials are in initial stages of development and testing. Further review, revision, and evaluation will be necessary to provide appropriate materials and content for teachers utilizing the INDUSTRIOLOGY materials. As constant changes take place in industry, so must these same changes be reflected in any INDUSTRIOLOGY program.

Many individuals and industries have contributed to the development of these INDUSTRIOLOGY materials. Special acknowledgement and recognition is due to the twenty-four experienced industrial arts teachers from across the United States who were instrumental in laying the groundwork for the initial development, trial and testing, and subsequent revision of the content which has resulted in making this material possible.

Industriology Staff

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# PREFACE

Focusing attention upon exposing children to a broad and comprehensive study of industry through the INDUSTRIOLOGY Concept, Phase I--*Development and Structure of Industry*--provides instructional materials to assist student and teacher alike in studying industry and in understanding the complex role which industry plays in an ever expanding technological society. *Development and Structure of Industry* is primarily concerned with fulfilling the following objectives:

1. To develop in each student an understanding of what industry is.
2. To develop in each student a general understanding of the development of industry and the affects and implications on modern society.
3. To develop in each student a general knowledge of the various types of industries in the world today.
4. To develop in each student an awareness of and a general understanding of the typical activities conducted in most industries.
5. To develop in each student a basic degree of skill in the use of industrial type tools and machines.

In order to accomplish the above objectives, a study of the industrial economic system is made by examining the total concept and how it functions. Included in this examination of the system is a study of the history and development of industry, a study of four general types of industries which make up this industrial complex, and a study of six basic activities typically found in most industries. The four general types of industries studied are: raw materials and extraction, manufacturing, distribution, and service. The six basic activities studied are: (1) product development and design, (2) internal finance and office service, (3) manufacturing or processing, (4) marketing, (5) industrial relations, and (6) purchasing.

The content of this study guide serves as a basis upon which the other instructional materials in Phase I are related and integrated. This material is designed to stimulate the student to investigate, read, solve problems, and participate in manipulative activities concerned with INDUSTRIOLOGY.

The teacher is encouraged to graphically reproduce the content of the study guide in any form he wishes in order that he may utilize it and adapt it to his particular school situation. It is expected that some ideas other than those outlined will be tried as the instructor discovers other new and challenging approaches to teaching INDUSTRIOLOGY. The instructor is directed to note that references designated with an asterisk (*) by their number are recommended for students in INDUSTRIOLOGY and should be made available in quantity for student use. The other references listed may be found in most public and school libraries.

Other instructional materials which have been developed for Phase I--*Development and Structure of Industry*--include a booklet for each of the following:

1. A Teaching Plan and Activity Sheets

2. Information and Job Assignment Sheets

3. An Instructional Aids List and Bibliography

Each of the above booklets has been developed for the express purpose of providing the instructor with instructional materials in conjunction with the study guide for Phase 1. It is recommended that full utilization of these booklets be made as far as it is practical for the instructor to do so in his particular situation.

# INTRODUCTION TO INDUSTRY

## DEFINITION AND DEVELOPMENT OF INDUSTRY

Over 100 million people in the United States are involved in industry. Industry is products, processes, materials, and profit, and just as important, it is organization and people. Even if you are not one of those people directly involved, your life will be affected by the happenings and changes in industry.

Any branch of business, trade, or manufacturing that involves people, materials, and processes organized to make a profit is an industry. Most industries can be put into one of four classes--raw materials, manufacturing, distribution, or service.

The raw materials industries remove raw material such as timber, petroleum or ore from their natural habitat. The manufacturing industries change the raw materials into forms suitable for consumer use. Either the raw material or the product made from it is taken by the distribution industry to the place where it is sold or used. The industry which repairs and maintains the manufactured goods is a service industry.

Industry had its start in America with the domestic system--production in the home and its immediate surroundings. Gradually a few people specialized where their talents lay--for example: blacksmith, tailor, potter, or woodworker. These specialists congregated and started small factory systems.

After the Civil War, the factory system was expanded until industry exceeded agriculture as the major economic activity in the United States. Two new sources of power--the electric dynamo and the gasoline engine brought power to the work instead of the work having to be taken to the power as was the case with steam. The assembly line of mass production evolved.

One of America's largest industries--the automobile industry--began in the early 20th century. This is still one of our greatest mass production industries. World War II caused a rapid expansion of all industries and many new industries arose because of atomic and nuclear energy, electronics, jet and rocket engines, and the development of automation.

Your study of this material will give you the opportunity to learn more about the development of our complex industrial system and its future problems and challenges.

Assignments:

1. Read the references listed.
2. Locate pictures or articles pertaining to industries. Beginning with 1700, group the pictures in "50 year" categories according to their development.
3. Make a list of as many industries as you can and classify them according to the four types: Raw Material, Manufacturing, Distribution, and Service.
4. Read Industrial Arts & Vocational Education magazine articles in Jan., Feb., April, May and June, 1959 "Our Automated Industrial Revolution" and be prepared to report on them.
5. Read "Evolution of Mass Production" by the Ford Motor Company.
6. Select an industry and describe, in a short paper, its origin and progress to date.
7. List 10 important people who have contributed to industry and tell what each did.
8. If you had a job this past summer, explain this job and classify it according to one of the four major types of industries.
9. Be prepared to discuss the study questions listed.

## References:

1. *A Study of Industry-Industriology*, Wisconsin State University-Platteville, 1968.
2. Barnes, *An Economic History of the Western World*, Harcourt, Brace, and Company, 1937, pp. 300-304.
3. Glover and Lagai, *The Development of American Industries*, Simmons, Boardman Publishing Corporation, 1959, pp. 83-116.

*4. Smith and Maddox, *Elements of American Industry*, McKnight and McKnight Publishing Company, 1966, pp. 255-271.

*5. Gerbracht and Robinson, *Understanding America's Industries*, McKnight and McKnight Publishing Company, 1962, pp. 209-237.

*6. Scobey, *Teaching Children About Technology*, McKnight and McKnight Publishing Company, 1968, pp. 2-4.

## Questions:

1. What is industry?
2. What was the purpose of the Sherman Anti-Trust Act of 1890?
3. Who were these people and what part did they play in the development of American industry?

   Eli Whitney
   Robert Fulton
   Samuel Morse
   Henry Ford
   Oliver Evans
   John Winthrop
   Cyrus McCormick
   Frederick Taylor

4. What were the four great inventions?
5. What are 5 large American corporations?
6. Does industry affect political and social conditions?
7. How have wars and depressions affected industry?

8. What do you believe would have happened in the U.S. if it had not been for the invention and use of the following: steam power, reaper, gasoline engine, and electric generator?

9. How did the American Revolution influence industry in America?

10. Make a list of 5 labor leaders of the past and 5 of the present.

# INTRODUCTION TO INDUSTRY

## FUNCTIONS AND IMPLICATIONS

How do we get metal? How many people does it take to make a TV set? How does the local grocery store get its goods? What is the responsibility of an industry to a customer? What is free enterprise?

The answers to these questions appear to be quite simple, BUT ARE THEY? Industry is very complex; it is made up of materials, men, money, and natural resources. How these four elements are put to work together, will give an idea of how industry functions, and what implications it has for living in the world of today and tomorrow.

The main objective of industry is to make a profit. There are great risks involved, and not all businesses are successful. The study of this material will enable you to investigate information about the labor force, taxation, government regulations, markets, planning, public attitudes, technology, transportation, housing, money needs, education, demands for products, and many other areas of concern to the successful operation of an industry.

Assignments:

1. Read the listed references.
2. Make a list of raw materials that years ago we could export but today need to import.
3. Write two short paragraphs on what has been happening over the last 50 years as far as the labor force in the country is concerned.
4. What effect has competition had on industry and what effect will it have ten years from now? (Look up information and prepare a short paper to answer the above question).
5. Trace the formation of unions since their beginning and be ready to discuss it in class.

6. Describe the occupation of your father or some other person and trace the changes in this occupation which have taken place within the past twenty years.

7. Be prepared to discuss the study questions listed.

References:

1. Laird, How to Get Along With Automation, McGraw-Hill Book Company, 1964.

2. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962.

*3. Smith and Maddox, Elements of American Industry, McKnight and McKnight Publishing Company, 1966, pp. 256-271.

*4. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 209-237.

*5. Gilbert, Children Study American Industry, Wm. C. Brown Company, Publishers, 1966, pp. 17-21.

*6. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 74-84.

Questions:

1. What is scientific management?

2. What are the basic principles of manufacturing?

3. What types of control does society have on industry?

4. Explain what is meant by horizontal, vertical, and lateral expansion of an industry.

5. What are the trends of industrial plants today? How are these trends similar to schools?

6. How do people in industry communicate with each other?
7. Why does industry conduct research?
8. What is the most frequent cause of business failure?

# INTRODUCTION TO INDUSTRY

## INTERNAL ORGANIZATION

All industry, large or small, must have internal organization. The local store owner is an example of a one owner, small business. Many large corporations started as a one owner operation but as business increased it was necessary to expand the number of people involved. Areas such as administration, purchasing, production, service, and sales became too complex for one or even a few people to manage. These problems were solved by setting up a corporation. The corporation is a group of people who supply the necessary capital and assets needed to run the industry. A charter is then obtained and shares can be sold to obtain more capital if needed.

No two companies are structured alike; however, most private enterprise companies are one of four types: (1) one owner, (2) partnership, (3) cooperative or (4) corporation.

This material will be concerned primarily with the internal organization of an industry. Usually this organization is composed of two types of people: (1) line organization--employees who are the people directly concerned with the product, and (2) staff employees--those who support the people making the product. Some of the departments that industry has set up are as follows: finance and office service,purchasing, quality control, marketing, industrial relations, engineering,and manufacturing. The functions of these line and staff departments are to be studied in connection with internal organization.

These are but a few of the variable aspects of industry. As time allows, we shall concern ourselves with some of the other principles that make industry the driving force that it is in human efforts.

Assignments:

1. Read the listed references.

2. Look up the words "internal" and "organization" and be prepared to report on your findings to the class.

3. Trace the internal organization of your school system and compare it with that of some industry.

4. Make a chart illustrating one of the five types of organizational structures, and be prepared to report to the class the differences which exist between the different types of organizations in industry.

5. Using the Dictionary of Occupational Titles or the Occupational Outlook Handbook, look up the different classifications given to engineers and list them so we can discuss them in class.

6. Be prepared to develop a flow chart for a small company or organization.

7. Determine the different kinds of industries which are found in your town or city and classify each according to one of the four types of industry.

References:

1. Bethel, et al., Industrial Organization and Management, McGraw-Hill Book Company, 1962, pp. 32-52.

*2. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 209-237.

*3. Smith and Maddox, Elements of American Industry. McKnight and McKnight Publishing Company, 1966, pp. 256-271.

4. Dictionary of Occupational Titles, U. S. Dept. of Labor, 1968.

5. Occupational Outlook Handbook, U. S. Dept. of Labor, 1968-69.

Questions:

1. Why does an industry have internal organization?
2. What are the major areas of the internal organization and what role do they play in production?
3. What is meant by the line of an organization?
4. What is meant by industrial diversification?
5. What important role does time and motion study play in a production industry?
6. What is the purpose of a flow chart? What different types of charts are used in industry?
7. What is a corporation?
8. What relationship does a corporation have to that of the products which it offers to the public for sale?
9. What part does the public play in determining what industry produces?

# RAW MATERIALS INDUSTRIES

Long before the beginning of recorded history, man has looked to the earth for materials from which to build his shelters and to make his tools and utensils. Over the centuries, this gouging and scratching at the surface to find clay, flint, bright stones, or occasional pieces of native copper evolved into a burrowing beneath the surface in the broadening search for mineral materials. As history has progressed, the need for minerals has increased, and the search has gone on.

This area of study centers around one of the four basic types of industries known as the raw materials industries. In general, a raw materials industry is a type of industry which supplies the materials that are used by other industries in further processing and manufacturing.

There are many classes and types of raw materials industries. In an attempt to establish some classification and degree of uniformity, several major headings are used. Upon examination, it should be readily understood that a comprehensive study of each raw materials industry would not be feasible. With this being the situation, the major headings used to cover the majority of the industries either directly or indirectly are non-mineral and mineral. Mineral is further classified as metallic and non-metallic.

Assignments:

1. Read the listed references.
2. Look up and write out the definitions of "mineral", "non-mineral", "metallic" and "non-metallic".
3. Be prepared to discuss the listed study questions.

References:

1. Guest, et al., (eds), A World Geography of Forest Resources, The Ronald Press Co., 1956, pp. 83-111.

2. Lamey, Metallic and Industrial Mineral Deposits, McGraw-Hill Book Company, Inc., 1966, pp. 2-105.

3. Morgan, World Sea Fisheries, Pitman Publishing Corporation, 1965, pp. 14-26.

4. Scheer, Approved Practices in Fruit Production, The Interstate Printers and Publishers, Inc., 1964.

*5. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 238-255.

Questions:

1. What are raw materials?
2. What raw materials are found in our locality?
3. Why is conservation an important factor in relation to raw materials?
4. What are the two classifications of raw materials?
5. What geographical areas of the U. S. are widely known for their large resources of raw materials?
6. What effect has the shortage of some raw materials had on certain industries?
7. What are several methods of locating and extracting raw materials?
8. Are oxygen, nitrogen, and hydrogen raw materials? If so, how are they extracted?

# RAW MATERIALS INDUSTRIES

## FORESTRY

As the population of our country has grown, so has the demand for the products of forests. More ways are being found to use the lumber. By-products of wood are being developed and wood which was once wasted is now being used. The forest industries furnish a large portion of the material for factories and railroads. In sixty-three cities in the United States it was found that eighty-one per cent of the homes were made of wood and furnished with wood products.

Some persons think that in order to save the forests, substitutes for wood products should be developed. This is not necessary. The conservation of forests means simply saving them and using them wisely. It is possible to obtain wood products for many years if forests are replanted and properly cared for.

About two-thirds of the sawed timber is needed by factories which use wood not only in their own products but also in getting supplies and in marketing their goods. Many conifers, such as the southern pine, when tapped, yield a gum which can be distilled and used in the making of paint, varnish, polishes, roofing, plastics, paper, electrical equipment, soap, greases, crayons, and many other items. Wood pulp furnishes the material for the greater part of our paper supply, although rags are used for the better grades of paper.

Wood is also used in the manufacture of cellophane. Sawdust, when combined with certain chemicals may be used in making plastic products. From the wood, bark, and leaves of many trees, such as the hemlock, oak, and chestnut, comes an extract used for tanning leathers. In your study of this material you should become acquainted with many facets of the forestry industry and related products.

Assignments:

1. Read the listed references.

2. On a sheet of paper, sketch a tree and label it to illustrate: (a) its three main parts and (b) the purpose of each part.

3. Using a single-edged razor blade or sharp knife shave a thin cross-section piece of wood from both a soft and hard wood. Place these two cross-sectioned pieces together under a powerful magnifying glass and compare the difference in the cellular structure of soft and hard wood. Write a one-page paper explaining your findings.

4. Write out and be prepared to discuss the study questions listed.

References:

1. Vance, Industrial Structure and Policy, Prentice-Hall, Inc., 1961, pp. 346-369, and 377-381.

2. Guest, et al., (eds), A World Geography of Forest Resources, The Ronald Press Company, 1956, pp. 83-111.

3. Douglass, et al., Units in Woodworking, McCormick-Mathers Publishing Company, Inc., 1967, pp. 5-17.

*4. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 17-21, and 37-42.

*5. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 100-107

Questions:

1. In some places, where timber cutting is regulated, lumbermen are required to leave a strip of trees several yards wide along the borders of lakes and highways. Why?

2. It requires about ten years for a maple tree and eight years for an oak to add an inch to its diameter. Each is ready for cutting only after its diameter has reached at least twelve inches. How old should each tree be before cutting?

3. What effect has each of the following had on forest growth?

   a) ground and crown fires
   b) bark beatles
   c) the gypsy moth
   d) hogs
   e) fungi

4. What is the advantage of being able to extract turpentine and resin from stumps?

5. Why might forestry be considered as a form of agriculture?

6. Explain what each of these words mean to you: a) reforestation, b) clear cutting, c) partial cutting, d) seeding, e) culling.

7. What happens to a forest when it is overcut?

8. How is the number of board feet in a tree determined before the tree is cut?

9. In the efficient production of lumber, how does the older method of getting lumber to the mill compare to that of the newer methods?

# RAW MATERIALS INDUSTRIES

## RUBBER AND SYNTHETIC RUBBER

There is almost no limit to the things that rubber can do for us. We use it for automobile tires and engine mountings, for clothing, for surgical gloves, for erasers, for electrical insulation of battery plates, and for thousands of other purposes. Rubber is a scientific product which research chemists are continually attempting to improve.

Charles Goodyear devoted years experimenting with rubber and finally developed vulcanization which would keep rubber from changing with the weather and make it permanently useful to man. The solution was rubber plus sulphur plus heat, at the right temperature, for the right length of time.

A rubber plantation looks like a well-kept orchard, with thousands upon thousands of tall Hevea trees stretching out in long regular rows. Rubber as it comes from the plantation would be of no use to us. The magic of rubber today is the magic of chemical changes which take place when latex and chemicals are treated to produce useful rubber products. Since World War II many new synthetic rubbers have been developed. Most of them are special-purpose rubbers, inferior to natural rubber for general use, but for their particular purpose they often equal natural rubber and sometimes surpass it.

Assignments:

1. Read the listed references.
2. Write out and be prepared to discuss the listed study questions.
3. From your reading assignments develop a list of words that are common to the rubber industry--such as: latex, masticator, vulcanization, pneumatic, coagulating, isoprene, styrene, etc.

References:

1. Mersereau, Materials of Industry, McGraw-Hill Company, Inc., 1947, pp. 80-81.

2. Graham, Rubber, Firestone Tire and Rubber Company, 1966, pp. 11-13.

3. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, p. 38.

Questions:

1. How are rubber trees tapped to get the latex?

2. How would you define the location of the rubber belt around the world?

3. Define the term coagulating.

4. What is meant by the term "rubber compounding"?

5. Why did synthetic rubber become more prominent in World War II?

6. Why does latex have to be cured?

7. What is the process used in curing latex?

8. What problems would be involved in attempting to raise Hevea trees in the United States?

9. Are there vegetable plants, other than the Hevea tree, from which rubber might be economically produced?

# RAW MATERIALS INDUSTRIES

## FISHING

In almost every part of the waters that cover about three-quarters of the earth's surface, living creatures can be found. They range in size from the microscopic plankton to the whale, which is considered the largest living thing. These living creatures include such varied forms as fishes, seals, lobsters, oysters, clams, sponges, squids and octopuses just to mention a few.

The name, fishing, is given to the harvesting of the many products of the sea. This name applies not only to the catching of fish but also to the hunting of seals and whales and other mammals that have their home in the sea.

Every year approximately 30 million tons of fish are caught for human food. Commercial fishing in the United States alone employs about 129,000 fishermen and produces more than 5 billion pounds of fish per year--the value of which is about 381 million dollars.

This material will enable you to study the fishing industries.

Assignments:

1. Read the listed references.
2. Make a list of the major kinds of fish having commerical value caught on the West Coast.
3. Make a similar list for the East Coast.
4. Research the use made of the whale.
5. Draw a sketch of a purse sieve, otter trawl, gill net and a pound net.
6. Write out and be prepared to discuss the listed study questions.

References:

1. Morgan, World Sea Fisheries, Pitman Publishing Corporation, 1955, pp. 27-48.

2. "Fishing", Compton's Pictured Encyclopedia, Vol. VI, 1967.

3. Cooke, Marvels of American Industry, C. S. Hammond & Company, 1962, pp. 85-88.

*4. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 131-134.

Questions:

1. What are five countries leading in millions of pounds of fish caught per year?
2. Are any fish of commerical value caught in our rivers and streams? If so, name several varieties.
3. Name some uses, other than food, that man makes of marine life.
4. What are some of the methods by which commercial fishing is done?
5. What are some industrial products obtained from the body of fish?
6. Are commercial fishermen paid by the hour, the "catch", by the pound, trip, or are they paid a regular salary?
7. Is there such a thing as a fishermen's union?
8. Is commercial fishing a seasonal job?

# RAW MATERIALS INDUSTRIES

## AGRICULTURE

Farming is the complex and scientific business of producing both plant and animal products which are needed by man. It is the oldest occupation in the world and although many others have come and gone, farming is still as important as ever. Because agricultural products largely determine the manner and means of human existence, they have had great influence on the development of civilization. Throughout the long history of mankind, food has had a direct effect in determining types of government, the winning or losing of wars, and the rise or fall of nations.

Although the importance of our agriculture has been stressed more in the time of war by such slogans as "An army travels on its stomach" and "Food will win the war and write the peace", it has been an important factor in the development of our nation during peace as well. No nation can ignore the basic importance of agriculture if it is to continue to progress.

Most people probably do not realize how important plants are in their daily lives, for human nature has a tendency to take many things for granted. Many people fail to realize that we are still just as dependent upon plants for survival as primitive man was thousands of years ago. Not only do plants provide us with food, clothing, and shelter, but other necessary or desirable articles as well. All of our food and clothing is produced either directly or indirectly by plants.

Assignments:

1. Read the listed references.
2. Draw a map of the United States and divide it into types of farming areas. Describe the type of farming done in each area.
3. Write out and be prepared to discuss the study questions listed.

References:

1. The Yearbook of Agriculture, The U. S. Department of Agriculture.

2. Cole, (ed), Introduction to Livestock Production, W. H. Freeman & Company, 1962.

3. Delorit and Ahlgren, Crop Production, Prentice-Hall, Inc., 1959.

4. Hall and Mortenson, The Farm Management Handbook, Interstate Printers & Publishers, Inc., 1963, pp. 34-57.

5. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 59-84.

6. "Farm Life", Compton's Pictured Encyclopedia, 1967, Vol. 5.

*7. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 121-158.

Questions:

1. What is meant by a farming-type area? What are the seven types?

2. Of the seven types of farming areas, which would be the type in your area?

3. What are the important things that determine a farming-type area?

4. Why would you expect to find the center of the hog producing areas in the states of Iowa, Illinois, and Indiana?

5. Name the major agricultural products raised in your area.

6. What are the important characteristics of the northern part of the United States that makes it so productive?

7. Give three important reasons why there has been a rapid change toward larger farms during the past 10 to 15 years.

8. What crops or kinds of livestock have increased the most during the past five years?

9. What is a farmers union? What function does it serve? What is its name?

# RAW MATERIALS INDUSTRIES

## THE MINERAL INDUSTRIES

Today, the mineral products of the earth are so widely used that they affect every aspect of our lives. Today the average American is the largest consumer of minerals the world has ever known.

The enormous appetite of modern technology for raw materials and the ability of the earth to satisfy this appetite, is the starting point for any consideration of minerals. The stock which is in the earth today must serve all people for all time.

Exploration is, moreover, a major expense which may represent complete loss if no economic deposits are found, following perhaps several years of search. After surface study, the confirmatory and final test of the presence of valuable mineral matter is the opening that exposes it. This opening may be made by stripping off the surface overburden or by penetrating to the deposit through drilling, test pitting, trenching, tunneling, shaft sinking, crosscutting, or drifting.

Your study of the minerals industries will help you discover that these industries are not limited to the metallic minerals such as iron, copper, and other common metals. It also includes a study of obtaining non-metallic minerals such as water, oil, gas, and many other such minerals taken from the earth and its atmosphere.

Through an acquaintance with minerals extraction and production you will discover the various methods needed to produce fluid minerals (water, oil, etc.) as well as the so-called "solid" minerals (rocks, iron, etc.).

Assignments:

1. Read the listed references.

2. If available, find some rock samples containing different ores. Bring them to class for discussion.

3. Make a chart showing what new materials go into the manufacture of some metal products such as an automobile.

4. Review your notes on the definition of metallic and non-metallic minerals.

5. Write out and be prepared to discuss the study questions listed.

References:

1. A Study of Industry-Industriology, Wisconsin State University-Platteville, 1969.

2. Ludwig, Metalwork Technology and Practice, McKnight and McKnight Publishing Co., 1962.

3. "Minerals", Compton's Pictured Encyclopedia, 1967, Vol. 9.

4. Fenton and Fenton, Riches from the Earth, John Day Company, 1953, pp. 16-21.

*5. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 149-151.

Questions:

1. Name the different methods used to mine both fluid and non-fluid mineral raw minerals.

2. What are the two types of minerals?

3. In what ways are minerals essential to the life of man, plants, and animals?

4. How does a mining industry locate mineral deposits?

5. What is a geologist and what type of training and schooling is required for this type of work?

6. At one time aluminum was very expensive. Why was this? What caused the cost per pound to go down?

7. What special problems are involved in mining precious metals? How are these problems overcome?

8. Are there special problems involved in storing some raw materials before they are used in manufacturing?

9. What are two methods of mining salt?

# MINERAL INDUSTRIES

## METALLIC

The chemical elements are divided into two groups--metals and non-metals. Often it is difficult to distinguish between them. The metals obtained from ores are used in machinery and electrical equipment as well as buildings and bridges.

Mining is the branch of industry that is concerned with the search for and the exploitation, processing, and sale of minerals and rocks that occur in the earth's crust. Mining is considered a basic industry because it produces primary or raw materials that are used by many other industries.

The mineral reserves of a nation are depleted by exploitation and can never be replaced. Constant discoveries of new mineral deposits are made. Technological advances in mining methods have also made it possible to extract ores profitably from some lower-grade mineral reserves.

Your study of this unit will familarize you with some of the processes which the mining industry uses in obtaining the metallic raw materials for industry.

Assignments:

1. Read the listed references.
2. If possible, take a field trip through a mine.
3. Make a model of a mine or draw a side view of a three-level mine showing the shaft, some pillars and some device for getting the mineral to the surface.
4. Make a chart illustrating the steps through which magnesium is obtained from sea water.
5. Be prepared to discuss the study questions listed.

References:

*1. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 44-55.

2. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 27-36.

3. Glover and Lagai, The Development of American Industries, Simmons-Boardman Publishing Corporation, 1959, pp. 213-296.

Questions:

1. What are 5 major steps in a metal mining process?
2. Define the terms: ore, extraction, concentrates, strip mining, fossils, prospecting and asphalt.
3. What is a quarry?
4. What are the four main classes of minerals?
5. What is the Mesabi range and where is it located?
6. What is bauxite and how is it mined?
7. What is leaching of copper ore and how is it accomplished?
8. What is galena and how is it related to lead?
9. What is the flotation method of mineral recovery from ore?
10. By weight, how does magnesium compare to aluminum?
11. What is meant by gravity concentration or separation of zinc ore?

# RAW MATERIALS

## NON-METALLIC MINERALS

Non-metallic minerals usually receive less attention than their usefulness to man warrants. The non-fluid, non-metallic minerals such as rock materials in the form of building and crushed stone, rock for structural ceramic products, and gypsum are some examples of these non-metallic minerals used by man.

Some non-fluid, non-metallic minerals are used as chemicals for industry and medical science. Other such minerals classified as non-minerals used in industry are quartz, rubies, diamonds and semi-precious stones.

Fluid non-metallic minerals include crude oil and natural gas. These also play an important part in American industry. Certainly, we could not omit fresh ground water or sea water as fluid non-metalic minerals. Their importance to man is exceeded only by oxygen. Not only is water essential to man for his life processes, but it serves industry in many ways. It serves as a coolant, cleanser, a source of steam for power and for the generation of electricity.

Through this study of non-metallic minerals you shall become aware of the many different minerals (those other than metals) which industry produces and utilizes.

Assignments:

1. Read the listed references.
2. Orally describe in class the mining methods which are used to get the following from the earth: oil, gas, coal, and rocks.
3. Make a list of some products that are made from crude oil.
4. Make a list of some of the uses to which semi-precious and precious stones are utilized in industry.

5. Draw a diagram of a hydroelectric generator showing how water is used to produce electricity.

6. Write out and be prepared to discuss the listed study questions.

References:

*1. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 238-258.

Questions:

1. What is the difference in weight of a long ton and a short ton?

2. What is crude oil and how was it formed?

3. How deep is a well? Are gas wells as deep as oil wells?

4. What is coal and how was it formed?

5. How is drilling done to obtain oil and gas?

6. What does a chemical engineer's job for an oil company involve?

7. What are some methods by which coal, oil, and gas are transported?

8. Explain how water is used in industry as a coolant, cleanser, and for irrigation and power.

9. What special problems are involved in obtaining the land on which to drill for oil or gas?

# MANUFACTURING INDUSTRIES

The manufacturing industries utilize raw materials by making useful products from them for consumer needs. Many of these products are later used by another manufacturer in another consumer product while others go directly to the consumer for immediate use.

The manufacturing industries can be broken down into three main processes: analytical, synthetic, and conditioning. These three processes may be either a primary or a fabrication type of manufacturing.

In the analytical type, a raw material is broken down into one or more useful products. The synthetic type industry uses several raw materials and combines them into one useful product. In the conditioning industries, the raw material is changed by applying some action such as chemical or pressure to the raw material.

The following manufacturing processes will be used in this study: conditioning--metal, lumber, cement, glass, fabric, leather, rubber, and brick; synthetic--food processing and paper; analytical--chemical and petroleum.

You are going to see a great change in the skill and education of the work force of this country, locally as well as nationally. When you are of age to enter this work force, technological change will be even greater, making it necessary for you to seek employment in many different areas. Will you be ready for this change? Hopefully, the study of this material will help prepare you for this change because one out of every three of you will enter the manufacturing industries.

Assignments:

1. Read the listed references.

2. Write a paragraph on a phase of manufacturing that interests you most. Explain why it interests you.

3. Bring in samples of various manufactured materials.
4. Make a list of some of the manufacturing processes conducted in your community.
5. Make a list of five articles of use to you which have not gone through a manufacturing process.
6. Be prepared to discuss the study questions listed.

References:

1. Bethel, et al., Industrial Organization and Management, McGraw-Hill Book Co., 1962, pp. 171-177.
2. A Study of Industry-Industriology, Wisconsin State University-Platteville, 1968.

*3. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Co., 1962, pp. 209-237.

4. Vance, Industrial Structure and Policy, Prentice-Hall, Inc., 1961, pp. 1-24.

Questions:

1. What per cent of the total working force in the United States is engaged in manufacturing industries?
2. A major trend is developing in the manufacturing industry as to the type of worker being employed. Comment on this change.
3. What is the trend in regard to new industrial plants as to location, type of structure, employment, production demands and the equipment needed?
4. List the 12 primary components to consider before selection of a building site for manufacturing a product.

5. Explain what is meant by analytical, synthetic, and conditioning types of manufacturing.
6. Why do human wants affect manufacturing?
7. Did ancient man realize a need for manufacturing? Explain.
8. How do we measure the amount of manufacturing in a given locality?
9. What Federal Government agencies are concerned with manufacturing? Why are they concerned?
10. Do you believe that the Federal Government should be concerned about manufacturing? Why?
11. What is the trend in the educational requirements for employment in the manufacturing industries?

# MANUFACTURING INDUSTRIES

## METALS

The metals manufacturing industries probably touch more products and more lives than any other industry. We usually think of the metals industries as being those which manufacture iron and steel products although it must not be forgotten that manufacturing industries involved with the non-ferrous metals (metals having no iron in them) also play a large part in our American economy.

Machines are man's answer to the ever-present problem of securing greater results in a specified amount of allotted time. Without the use of metals, whether ferrous or non-ferrous, it would be impossible for man to produce the machines which in turn produce the many products which he uses.

In your study of this material you will explore the metals manufacturing industries. You should gain an understanding of what is involved in manufacturing a product, both from the standpoint of a "custom" made product method as compared to the mass production product method.

Assignments:

1. Read the assigned references listed.
2. Draw diagrams of the following: Bessemer converter, open hearth furnace, and an electric furnace.
3. If available, consult the Occupational Outlook Handbook, select an occupation from a metals manufacturing industry, and make a study of it. Determine the following facts:
    a. What does the worker do and what are the safety hazards?
    b. What is his wage or salary?
    c. With what metals would he work? Where would he have to locate geographically to get the job?

4. Make a list of three companies which produce articles made principally from each of these metals: copper, magnesium and steel.

5. Draw a flow chart diagram showing major points of the assembly of an automobile.

6. If possible, obtain a short piece of high voltage transmission cable made of aluminum and compare it to a like size copper conductor.

7. List the names of two companies which manufacture the following products:

    a. submarines
    b. heavy earth moving equipment
    c. electrical wire
    d. outboard motors
    e. railroad engines
    f. cook ware
    g. surgical instruments
    h. farm machinery
    i. metal toys

8. Be prepared to answer and discuss the study questions listed.

References:

1. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 242-244.

*2. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 219-236, 252-255.

3. Glover and Lagai, The Development of American Industries, Simmons and Boardman Publishing Corp., 1959, pp. 219-296.

4. Compton's Pictured Encyclopedia, Vol. IX., 1967.

*5. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 109-113.

Questions:

1. In the manufacture of steel, what two main things must be done to the pig iron before it can become steel?
2. What are three types of furnaces used to make steel?
3. How does the process of making aluminum differ from that of iron?
4. What is electro-refining of copper and why is it done?
5. What is meant by the mass production method?
6. What is a custom produced product?
7. Where was the interchangeable parts method first used in manufacturing a product in the United States?
8. What industry uses a large amount of gold in manufacturing a product?
9. Is lead safe to use as a material for water pipes? Explain your answer.
10. What industry uses a large amount of magnesium in its product?

# MANUFACTURING INDUSTRIES

## Fabrics

Textiles are woven cloths and fabrics and may be made from any kind of animal, mineral or vegetable fiber or from man-made chemical fibers such as spun glass, nylon and rayon.

The making of cloth is one of the oldest industries known to man and began as a hand industry long before there were any power-driven machines. The invention of some textile producing machines ushered in the mechanized textile industry; providing cheaper fabrics than the world had ever known before.

Three major developments are identified in the history of the textile industry. These are Eli Whitney's cotton gin, the creation of artificial silk fiber by a Frenchman, Hilaire de Chardonnet, and the production of nylon which, of course, stimulated further research and thus has resulted in many other man-made fibers.

Textile factories drain off products of many other industries. In turn, they furnish most of the raw materials for the huge garment industries. Rubber industries are provided with cord fabrics with which to manufacture tires. They supply furniture factories with upholstery materials and paper industries with felts.

The manufacture of textiles involves many different processes utilizing simple to very complex computerized tape punched machines. In this study you will become acquainted with some of the more important aspects of the textile industries.

Assignments:

1. Read the listed references.
2. Using a powerful magnifying glass or microscope, compare cotton fibers with those of flax, wool, silk, nylon and rayon fibers. Also compare the weave of samples of cloth made from each of these fibers.

3. Take a 12" length of rope, unravel it and take it apart. Explain to the rest of the class what you learned from this.

4. Obtain some raw wool and cotton and see if you can spin it by hand.

References:

1. Compton's Pictured Encyclopedia, Vol. 14, 1967, pp. 131-141.

*2. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 181-207.

3. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 245-251.

*4. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 161-184.

Questions:

1. What are six basic ways in which textile fabrics can be made from fibers and yarns?

2. What method is used to clean wool and how is it done?

3. Define the following terms used in preparing fibers for textile weaving and explain why it is done.

   a. carding
   b. scouring
   c. bleaching
   d. calendering
   e. tentering
   f. weighting
   g. nap

4. Describe the following specialized categories of mills for the manufacture of yarns:

   spinning mills
   weaving mills

5. Explain what is meant by the term "gray goods".

6. For many years a great problem of the textile mills was the breaking of threads during the weaving operation. When and how was this corrected?
7. Identify five animals that produce fibers for textile products.
8. Identify three plants from which fibers may be utilized to manufacture textiles.
9. What are ten sources of raw materials from which man-made-synthetic-fibers are manufactured?
10. How are designs printed on fabrics?

# MANUFACTURING INDUSTRIES

## FOOD PROCESSING AND RELATED ACTIVITIES

This unit will deal with the processing and manufacturing of products which are considered as being used for human consumption. This includes any solid or liquid foods and beverages and may involve freezing, drying, baking, cooking, brewing, distilling, bottling, and packaging, or processing in any other way. This study shall also include the manufacturing and processing of tobacco and medicine products.

It should be noted that some products, such as tobacco and alcoholic beverages consumed by man are not considered as being essential to man's life processes. Although we do not consider these products as such, the manufacture and processing of such products constitutes multi-million dollar industries requiring many different skills of thousands of workers.

The processing of foods such as vegetables and fruits, meats and bread products may involve many types of varied processes in order to preserve the products. The processing of food makes possible the availability for human consumption many foods in all seasons throughout the world. Because many foods can be stored for future use, it has become a means of increasing the amount of food available during any season of the year to hungry peoples of the world.

The material on food processing and related activities will provide you with an opportunity to study how food products are processed.

Assignments:

1. Read the listed references.
2. Draw a chart diagram illustrating steps necessary to produce flour from wheat.

3. Draw a chart diagram illustrating the major steps through which a vegetable is processed and canned. Do the same for a soft drink.

4. Make a list of the various uses to which sugar is put other than for human consumption.

5. Draw a diagram to illustrate the many steps through which sugar goes from the sugar cane to the finished product for table use.

6. Place a teaspoon of vinegar in a 1/2 cup of milk and let it sit for 15 minutes and write up the results.

7. Be prepared to discuss the listed study questions.

## References:

1. Cooke, *Marvels of American Industry*, C. S. Hammond and Company, 1962, pp. 65-84.

2. Vance, *Industrial Structure and Policy*, Prentice-Hall, Inc., 1961, pp. 438-503.

3. Glover and Lagai, *The Development of American Industries*, Simmons-Boardman Publishing Corporation, pp. 337-375.

*4. Scobey, *Teaching Children About Technology*, McKnight and McKnight Publishing Company, 1968, pp. 121-158.

## Questions:

1. What are some of the by-products of white flour and where are they used?

2. Define the following terms and where used:

   Quick freezing
   Blanching
   Drying
   Fermentation
   Brewing
   Distilling
   Meat inspection
   Milk testing
   "Patent" medicine
   Prescription

3. What are some of the special food products obtained from those parts of the animal body which were considered at one time as non-edible flesh?

4. The production line in processing beef, pork and sheep is sometimes considered as being opposite to the assembly-line production. Why is this? Explain.

5. If meat is going to be cooked why have it inspected at all? How is the inspection of meats done?

6. What are some of the raw materials used in brewing and distilling alcoholic beverages?

7. What are some tests that are "run" on milk to determine its useability for human consumption?

8. What are some uses of sugar and salt in industry as opposed to human consumption?

9. Explain how coffee is made and processed beginning with the bean to the canned product.

10. Explain the process of tobacco curing and why it has to be done.

# MANUFACTURING INDUSTRIES

## CHEMICAL PRODUCTS

The history of the chemical manufacturing industry had its beginning in the "black magic" era when it was considered superstitious and witchcraft to combine or extract any elements found in nature. It moved from this position at the beginning of the Christian era through the alchemy period to about the 18th century when it then became recognized as a legitimate industry with tremendous possibilities.

For the United States the real beginning of the chemical industry began as a direct result of having chemical supplies from Germany cut-off during World War I. Germany, at that time was the world's most advanced and largest producer of chemical products. The story of some of our well-known synthetic chemical products is a story of America's research ingenuity and perseverance in industry.

Many of the products created chemically have been developed from waste products of other chemical products. New synthetic fuels are being experimented with to find substitutes for petroleum products, should this source of supply ever be exhausted.

Synthetic products are found being used in toys, cooking utensils, medical science, building construction, automobiles, packaging, and many other items.

The major aim of the chemical manufacturing industries is probably summed up best as the desire of an industry to provide better products for people economically. In this study of the chemical manufacturing industries you should become aware of some of the many chemicals, processes and products manufactured in this multi-billion dollar industry.

Assignments:

1. Read the assigned references.

2. Develop a chart or bulletin board showing pictures of many of the products which are made from coal.

3. Draw a diagram or pie chart illustrating the general percentages of funds expended in research, manufacture, and marketing in the chemical industries.

4. Make a large chart with 10 of the largest chemical industries in the U. S. List and place under each industry some of their brand name products.

5. Be prepared to discuss and answer the study questions listed.

References:

1. Vance, Industrial Structure and Policy, Prentice-Hall Inc., 1961, pp. 254-271.

2. Glover and Lagai, The Development of American Industries, Simmons-Boardman Publishing Corporation, 1959, pp. 297-331.

3. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 41-46.

*4. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 79, 106, and 360.

Questions:

1. What is the difference between a "natural" and a "synthetic" product?

2. What is meant by the terms "vertical integration" and "horizontal integration" of an industry?

3. Identify three companies which primarily manufacture: (1) acids, alkali, and organics, and (2) paint, fertilizers, synthetic fibers, and plastics.

4. Identify 5 founders of American chemical manufacturing and explain how and why each became a large name in this area of manufacturing.

5. What are two chemicals utilized in tanning leather? From where are these chemicals obtained or manufactured?

6. What are the basic chemicals and raw materials used in manufacturing nylon? How are these chemicals processed or combined to produce nylon?

7. What are some of the major chemicals used in a multi-stage rocket to give it the needed thrust?

8. How does the medical profession use chemicals? What are 10 chemicals which are used in medicines?

9. What special manufacturing problems are involved in producing medical chemicals?

# MANUFACTURING INDUSTRIES

## PETROLEUM PRODUCTS

Petroleum, one of the most useful materials known to man, provides energy-producing fuels such as gasoline, kerosene, fuel oil for furnaces and stoves, and fuels for trains, planes and ships. It also serves as a raw material from which many products are made in the plastics, rubber, medical and other industries.

The United States is now the world's largest producer and consumer of petroleum products. In total assets the petroleum industries in the U. S. are the third largest, employing somewhere near 1-1/2 million workers in approximately some 2000 separate occupations.

Once the crude oil is extracted from the earth, it may be processed into any number of by-products. The process through which the oil is taken is referred to as refining. This refining depends on the various stages through which the raw material --crude oil--is taken in "cracking" towers.

Through this study of the petroleum industry you will become acquainted with some of the processes through which the crude oil is taken in order to produce such products as high octane gasoline, liquified petroleum, tar, asphalt, kerosene, drugs, cosmetics, solvents, paints and thousands of other products.

Assignments:

1. Read the assigned references.
2. Using 3 test tubes of the same size place in each one separately, a sample of sewing machine oil, SAE 30 engine oil, and some diesel fuel. Compare the difference in their fluidity.
3. Make a chart of the major steps through which high octane gas is produced.

4. Develop a bulletin board showing some of the products which use crude oil as the raw material source.

5. Study and be prepared to discuss the study questions listed.

References:

1. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 33-36.

*2. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 243-247.

3. Vance, Industrial Structure and Policy, Prentice-Hall, Inc., 1961, pp. 272-304.

4. Glover and Lagai, The Development of American Industries, Simmons-Boardman Publishing Corporation, 1959, pp. 137-174.

Questions:

1. In refining crude oil to make petroleum products these terms are used very often. Define each of them.

   Thermal cracking
   Catalytic cracking
   Polymerization
   Alkylation
   Reforming
   Treating

2. Why does a gallon of the motor fuel we have today take us further in an automobile than a gallon of motor fuel made in 1920?

3. What are additives in automobile motor fuel and why are they put in the gasoline?

4. What are some of the petroleum products used by the jet age aircraft?

5. What is meant by an octane rating and how is it determined? What are some of these ratings?

6. How does fuel oil used for furnaces differ from gasoline used for automobiles?
7. What is liquid petroleum gas?
8. How is liquid petroleum gas manufactured?

# MANUFACTURING INDUSTRIES

## PRINTING AND PUBLISHING

Writing in its early stages took many forms such as symbols, letters, and drawings. Writing as such eventually developed into printing as a means of communicating thought. Because the printed word is a direct means by which people have become informed, the printing industries have become a multi-million dollar business.

The printing and publishing industry involves typing, typesetting, press work, photography, silk-screen processing, drawing, book binding and many other related skills to bring newspapers, books, pamphlets, catalogs and thousands of other printed items to people. These industries also include the printing of labels for canned products, printing of packages, bottles, rubber, metal and many other materials for identification and advertising.

In your study of the printing and publishing industries you will become acquainted with many of the various processes, methods, and materials used and the many skills of people involved in this important industry.

Assignments:

1. Read the listed references.
2. Make a list of materials besides paper on which you find printing has been done.
3. Visit a newspaper printing house or book publishing house and observe the processes involved.
4. In your note book make a list of these printing terms and define them.

Stencil
Vellum
Parchment
Relief printing
Rotary press
Composition
Cylinder press
Etching
Imposition
Linotyping

Lithography
Intaglio printing
Planographic printing
Graphic arts
Photoengraving
Electrotype plate
Platen press
Photo offset

5. List the following book manufacturing terms in the order in which each operation would take place in the phases of assembling a book.

Padding
Binding
Side stitching
Saddle stitching
Case binding
Signatures
Super
Headband
Collating
Book jacket
End paper
Lining

6. Study and be prepared to discuss the study questions listed.

References:

1. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 168-204.

2. Glover and Lagai, The Development of American Industries, Simmons-Boardman Publishing Corporation, 1959, pp. 692-705.

*3. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 81-111.

Questions:

1. What is a newspaper "margin"?

2. If a newspaper does not financially exist on the funds received through subscriptions, how does it survive?

3. What do these letters and terms mean? "scoop", UPI, AP, and Rueten Service.

4. What is the average wage in your area for a printer?

5. Gutenberg used what kind of material for making his movable type?

6. How has photography influenced the printing industries?

7. In what ways can the printing industries be related to mechanical drawing?

8. What processes are involved in obtaining a copyright on a story which you might send in to a magazine publisher?

# MANUFACTURING INDUSTRIES

## LEATHER AND RUBBER PRODUCTS

The leather products and rubber products manufacturing industries involve the use of raw and synthetic materials. Leather, being an animal by-product of the meat-packing industry, today is still used as a major material for covering the human foot. Approximately 80 per cent of the leather manufactured in the United States is channeled through the shoe industry.

Latex, a vegetable raw material for manufacturing rubber is no longer a necessary material from which rubber can be manufactured. Synthetic rubbers have been developed over the years with more and better types coming into common use in everyday items.

Your study of the leather and rubber industries will make you aware of the many processes through which leather and rubber must be taken in order to have a product which is desirable from the standpoint of good design, usability, and wear.

Assignments:

1. Read the listed references.
2. Develop a chart or bulletin board showing the various steps through which the hides are taken to manufacture finished leather.
3. Find pictures of the various animals from which leather is manufactured and place them on a display board listing some of the products obtained from the particular animals.
4. Make a chart showing the major steps in the manufacture of rubber beginning with the latex to the shaping and vulcanization of the product.
5. Study and be prepared to discuss the study questions listed.

References:

1. ______, Leather Facts, New England Tanners Club, Peabody, Massachusetts, Spencer Press, Boston, Massachusetts, 1965.

2. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 37-40, and 117-118.

3. Vance, Industrial Structure and Policy, Prentice-Hall, Inc., 1961, pp. 305-327.

4. Packet of Materials from Natural Rubber Bureau, 1108 16th St. N. W., Washington D. C. 20036.

5. Rubber, United States Rubber Company, Education Section, Public Relations Department, 1230 Ave. of the Americas, New York 20, New York.

6. Wonder Book of Rubber, B. F. Goodrich Company.

*7. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 232-235.

Questions:

1. What are the three major methods of tanning leathers?

2. List the uses to which the major vegetable tanned leathers are put.

3. How are hides procured by the tanners?

4. What process makes a hide into leather?

5. What is the difference between natural rubber and synthetic rubber?

6. What 5 industries are the largest manufacturers of rubber products? What are these products?

7. Before 1839 manufactured rubber goods became soft and sticky in the summer and hard and brittle in the winter. What man finally solved this problem and what was his process called?

8. Certain special terms are used in the leather industry to identify various processes in the manufacture of leather goods. What do the following terms mean?

   bating
   pickling
   splitting
   setting out
   conditioning
   staking
   finishing
   plating
   grading

9. Another name for horse hide is cordovan leather. In what part of the shoe is this type of leather used? Why?

10. Why is leather considered to be a better and healthier material to use for covering the feet as compared to rubber or plastic material?

11. What is a saddle stamp and how is it used?

12. What are the names of some tools which are used to "tool" leather?

# MANUFACTURING INDUSTRIES

## BRICK, CEMENT, GLASS, AND CERAMICS

Products such as glass, brick, cement, and ceramics are manufactured through heat processes and require different raw materials. Each of these products is made by different industries employing people with various skills.

The glass manufacturing industry involves not only the making of glass for windows of buildings and automobiles, but it also includes glass cooking and eating ware, spun glass fabrics and many other glass products.

The manufacture of bricks begins with an extractive process of clay similar to operations in metal and coal mining. The methods of manufacturing these brick may involve different techniques in crushing the clay and making the mud and firing the brick. Refractory brick manufacturing is a growing area of the brick industry.

Cement is usually thought of as the actual material poured from the ready-mix truck or from the mixing box. This material is actually called concrete which has as its base a cement material used to hold the sand, rock or other aggregate together. The cement itself must go through a firing process and be ground. It may be made for specific purposes and thus be a different type than made by another cement industry. The fact that man has learned to use the material--cement and concrete--to hold rock, bricks and other products together has made possible large and tall structure construction which early man was unable to accomplish.

Ceramic materials are made from clay and may take any shape or form for a variety of purposes. Their manufacture is somewhat closely related to brick making although molds are used into which the clay slip is poured and then removed when the product gets to the desired thickness.

In your study of the manufacture of these materials--glass, brick, ceramics and cement--you will have an opportunity to become acquainted with some of the unique skills and processes that take place in order to provide us with these everyday products which we too often seem to take for granted.

Assignments:

1. Read the listed references.
2. Describe seven steps or processes by which glass is formed into useful shapes.
3. Make a chart diagram of the basic materials used in manufacturing cement and illustrate the steps in this process.
4. Draw a diagram of a glass product being made by use of a glass mold, glass blowing, and pressing.

References:

*1. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 112-136.

2. Vance, Industrial Structure and Policy, Prentice-Hall, Inc., 1961, pp. 328-345, and 370-391.

3. Glover and Lagai, The Development of American Industries, Simmons-Boardman Publishing Corporation, 1959, pp. 417-461.

*4. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 90-100, 113-114, and 313.

Questions:

1. How is glass welded and where is this procedure used?
2. What is spun glass; how is it made and what are some of its uses?
3. What is cement and what gives it the property of adhering to other materials?

4. What is the difference between cement and concrete?
5. Are all bricks made the same size? Why?
6. What happens to a clay product when it is "fired"?
7. What is the "slip-mold" process of manufacturing a ceramic product?

# MANUFACTURING INDUSTRIES

## LUMBER AND PAPER

Man would be greatly handicapped without lumber with which to build. Although lumber is derived from forests which provide the material, the logs are of little use to us unless they are cut and properly dried for use in construction or properly processed for manufacturing paper and paper products.

Paper has been used for thousands of years as a vehicle for recording the written word. Paper is also used for packaging, labeling, and a variety of other industrial uses. Although some of the first paper produced was manufactured by a crude hand process, the same basic principle of interlocking vegetable fibers is necessary in the production of paper today.

In this study of the manufacture of wood and paper products you will become acquainted with some of the interesting facets of this very important area of manufacturing.

Assignments:

1. Read the study references listed.
2. Draw a diagram of the end view of a log showing how it is cut in order to provide plain-sawn and quarter sawn lumbers.
3. Draw a diagram of the steps through which paper is manufactured.
4. Examine paper fibers under a microscope or a high powered magnifying glass.
5. Write out and be prepared to discuss the listed study questions.

References:

1. Glover and Lagai, The Development of American Industries, Simmons-Boardman Publishing Corporation, 1959, pp. 71-82 and 376-393.

2. Vance, Industrial Structure and Policy, Prentice-Hall, Inc., 1961, pp. 346-369.

3. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 58 and 162-167.

*4. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 17-42, and 93-98.

*5. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 100-107.

Questions:

1. What is the difference between air-dried and kiln-dried lumber? Give some specific uses for each.

2. What is meant by the term, pre-cut house materials?

3. How does the pattern making industry use wood products?

4. What are the two major methods of cutting veneer wood from logs?

5. How is wood laminated?

6. What insect manufactures paper?

7. What holds paper pulp together making it a paper sheet?

8. What is a pigmented paper?

9. What are some other products being made from paper other than the common card-board box and paper on which newspapers are printed?

10. What is the approximate ratio of water to paper pulp in the manufacture of paper? Why is this ratio necessary?

11. What is plywood and how is it manufactured?

# MANUFACTURING INDUSTRIES

## CONTRACT CONSTRUCTION

Contract construction is usually thought of as the building of a house; however, the contract construction industry involves and includes much more than this. It is concerned with the creation of such buildings as office towers, skyscraper office buildings, hydroelectric dams, bridges, hangars, highways, supermarket and business houses, and many other types of devices which are primarily designed to withstand the elements of cold, heat, light and/or darkness.

In the future, contract construction of space platforms and stations in outer space is inevitable. Your study of the construction industries should help you to become more familiar with many of the aspects of this challenging, exciting, and creative area of industry.

Assignments:

1. Read the assigned references.
2. Draw or sketch several roof construction methods for residential homes.
3. Sketch a picture of one famous bridge in the United States.
4. Sketch a picture of a dam in the United States illustrating a sectional view of its structure.
5. Study one of the construction industries such as highway construction, and report on it. Make sure you include a list of the basic skills needed, what the work involves and some of the opportunities which it holds for employment.
6. Be prepared to answer orally any of the listed questions.

References:

1. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 89-101.

*2. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 22-26.

3. Occupational Outlook Handbook, United States Department of Labor, 1968, pp. 318-365.

Questions:

1. What is a contractor?
2. What does the term sub-contracting mean?
3. Why do most skilled laborers work only 40 hours per week?
4. What is a scaffold and to what use is it put in building construction?
5. How is it possible to prevent freshly poured concrete from freezing in cold weather climates?
6. What is slip forming?
7. How is ready-mix concrete kept from hardening during the trip to the job?
8. Describe the system of "tilt-up" method of erecting concrete structures.
9. What is pre-stressed concrete? How is it manufactured and where is it used?
10. What is a cantilever bridge? How does it work and why is it built this way?
11. What are three methods of residential house construction?
12. Is the manufacture of an Apollo space craft related to the construction industries? If so, what relationship is there?

13. What comparison can be made between the construction of a large sea-going vessel to that of a hotel structure?

14. What are some of the skills used by steelworkers in construction work?

15. How does a welder's occupation fit into the picture of building construction.

# DISTRIBUTION INDUSTRIES

Webster's New International Dictionary defines distribution as "the physical conveyance of commodities from producer to consumer". Producers, naturally, are those sources from which the commodities originate.

For our purpose, distribution is the transportation of goods from place to place. The systems of transportation may be broadly classified as land systems, water transportation, and air transportation.

Transportation of commodities occupies a definite and important position in our national economy. Without it, economic activity would be impossible. Every economic activity depends upon some form of transportation for its existence. Industrial plant locations are determined to a great extent upon their problems of moving raw materials and products of manufacture.

One way to observe the importance of transportation is to look at the loading docks of truck, rail, and ship terminals. If any of these means of shipment suddenly stops, the goods clog the terminals. This closes down business in the terminals and affects customers throughout the nation and the world.

In the study of this material you will have an opportunity to explore the distribution industries and the modes of transportation involved. We will study the effects of distribution on the economy of the nation, state, community, and the individual.

Assignments:

1. Read the listed references.
2. Make a chart of 10 American industries and identify the major methods of transportation which each uses to place its product on the market.

3. Make a list of distributive industries that serve your community.

4. List the major land system methods of transporting goods.

5. List three major raw materials that must be moved great distances to manufacturers.

6. Be prepared to discuss the study questions in class.

References:

*1. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962, pp. 261-268.

2. Cooke, Marvels of American Industry, C. S. Hammond Company, pp. 128-153.

*3. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 223-267.

Questions:

1. What two major transportation systems are strongly competitive with one another?

2. What major historical invention was the beginning of modern land transportation?

3. Define distribution industries.

4. What are five occupations common to the distribution industry?

5. List five materials that are transported by pipeline.

# DISTRIBUTION INDUSTRIES

## LAND TRANSPORTATION - RAIL, HIGHWAY, AND PIPELINE

Early railroads were mostly used in mines and short distance hauling, usually pulled by animals. As the nation expanded and the need for greater speed over longer distances carrying greater loads increased, steam engines replaced animal power and short lines were combined to eventually reach the far corners of the country.

In our study of railroads as a part of the Distribution Industries, we will study the history of railroads and their effect on our economy. We will also study some of the problems faced by the industry and certain controls placed on them by the government.

The motor carriers haul on the average about 12 billion tons of freight annually because of the lower transportation charges, flexibility of routes, frequency of service, and convenience. About three-fourths of all freight, including pipeline products, is moved at some point by truck.

In general, freight transportation can be divided into three main types, common carriers, contract truckers, and private carriers. This material will provide you with the opportunity to study the general types, regulations, and nomenclature of highway transportation.

Technological advances in materials and methods of laying pipe have made it possible for the pipeline industries to make a significant contribution to the transportation of many different materials. Pipelines are used for transportation of various liquids and gases under many circumstances, but their predominating use in the United States is for the cross-country transportation of crude oil, refined petroleum products, and natural gas. There is a new trend at the present to increase the commodities moved by pipelines, such as powdered coal, wood pulp, and chemicals.

Assignments:

1. Read the listed references.
2. Be prepared to discuss the listed study questions.

References:

1. Encyclopedia Britanica, Vol. 18, p. 927.
2. Secondary Department, Division of Curriculum Instruction, Power and Transportation, Milwaukee Public Schools, 1965.
3. Secondary Department, Division of Curriculum Instruction, Power and Transportation and Automotive Engine Tune-up, Milwaukee Public Schools, 1966.

*4. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 235-242.

5. Tunos, Wheels, The World Publishing Co., 1955.
6. Taff, Commercial Motor Transportation, R. D. Irwin, 1961.
7. "Pipelines", Encyclopedia Americana (1964), XX, p. 109.
8. American Trucking Associations, Inc., (Packet of Free Materials dealing with truck transportation).

Questions:

1. When was the first Transcontinental Railroad finished?
2. What is a Land Grant Railroad?
3. What agency of the Federal Government controls the railroads?
4. What labor problems have the railroads had?

5. What are several types of power used for locomotives?

6. What are some of the goods carried by rail?

7. What is the I.C.C.?

8. What are the three main types of freight transportation?

9. Explain what "piggyback" service is and where it is used.

10. What are some factors that have stimulated the use of highway distribution?

11. What do the truck classes I, II, and III represent?

12. Why are trucking regulations important to society?

13. The very first pipelines were used to transport what material?

14. From what were the first pipelines made?

15. Explain pipelines as a part of distribution industries.

16. Explain "Big Inch" and "Little Inch".

17. What material is now used to make pipelines?

18. Name four ways to connect the joints of a pipeline.

# DISTRIBUTION INDUSTRIES

## WATER TRANSPORTATION

Water transportation is the only form of commercial or for-hire transportation now in use which is older than the railroads. In fact, water movement was for many years the only type of economical transportation available for ordinary commercial purposes; and the population of the country, therefore, was limited to narrow areas along our sea coasts and the banks of navigable rivers. This was true until the early nineteenth century when the coming of the railroads opened up the vast interior of the country to settlement and economic development.

Domestic water carriers normally operate in coast-wide service along the Atlantic, Pacific, and Gulf Coasts; intercoastally through the Panama Canal between the Atlantic and Gulf Coasts on the one hand and the Pacific Coast on the other. On the Great Lakes, the domestic water carriers operate via the Atlantic and Gulf intracoastal waterways; and along various inland waterways, chiefly the Mississippi River and its tributaries and the New York State Barge Canal.

Water-borne transportation is considered the most economical and also the slowest. It is adapted mainly for large bulky cargo, where speed is not important. In most cases other means of transportation are needed to get the cargo to and from ports. To make shipping profitable, the ship needs a cargo load in both directions.

Water-borne commerce on the Great Lakes and their connecting channels is greater than on any other inland waterway. The recent development of the St. Lawrence Seaway now makes it possible for ocean-going vessels to bring cargo directly to the inland ports of the Great Lakes.

Assignments:

1. Read the listed references.

2. Be prepared to discuss water transportation in class.

3. Draw a map of possible water routes; list cargo and destinations.

4. Be prepared to answer the study questions listed.

References:

1. Canby, A History of Ships and Seafaring, Hawthorne Books, Inc., 1963, pp. 43-52 and 75-98.

2. Goodrich and others, Canals and American Economic Development, Columbia University Press, 1961.

3. "Water Transportation", Encyclopedia Britanica.

*4. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 242-255.

Questions:

1. Why did water transportation play an important part in American history?

2. What are some disadvantages of water transportation?

3. When did railroad transportation begin? What effect did this have on the country?

4. What recent development has opened new ports for ocean-going vessels?

5. What city is now gaining importance as a great port?

6. What is the greatest inland waterway?

7. What types of products or cargo are most adaptable for water transportation?

8. What problems could occur when shipping by water that would not happen by other carriers?

9. What type of jobs could you expect to find in water transportation?

10. Water transportation is a part of what industry?

# DISTRIBUTION INDUSTRIES

## AIR TRANSPORTATION

The first commercial use of airplanes was for the transportation of mail, which began in 1918. These operations at first were limited to daytime flights, night service being inaugurated in 1925. Passenger service began in the late twenties but in 1932 mail revenues still represented 80 per cent of the total operating revenues of air carriers. The frequency of operation of flights, provision of public airports, and the extension of air lines have caused a high increase in passenger transportation, thus increasing the revenue sources for air carriers. In 1946 the relative proportions of total revenue received were 87 per cent from passengers and less than seven per cent from mail.

There is still a definite place for air freight in the distribution of products. The outstanding characteristic of air transportation is speed. For long distance, its advantages in this respect are unrivaled. However, these advantages diminish, and in some instances, practically disappear, as the length of the journey shortens. Planes are used primarily for the movement of high priority and/or perishable goods over great distances. Manufacturers have found that they need fewer warehouses and less inventory for small high cost items. An order for an item can be filled out and sent quickly to any part of the country, or in many instances, any part of the world. These orders can be delivered as quickly, if not quicker, than if the company had warehouses located in strategic parts of the country or world.

Planes have almost a monopolistic hold on the movement of machinery and supplies into what would ordinarily be inaccessable areas, such as mines in the mountains and north woods. These areas usually call for planes with a large load carrying capacity and needing only a short runway to take-off and land. Helicopters are coming into increasing use for these reasons. Helicopters are especially helpful in transporting crews to offshore drilling towers.

Assignments:

1. Read the listed references.
2. Be prepared to discuss the listed study questions in class.

References:

1. Canby, A History of Flight, Hawthorne Books, Inc., 1963.
2. Air Transport Facts & Figures, Air Transport Association of America, Washington, D. C.

*3. Scobey, Teaching Children About Technology, McKnight and McKnight Publishing Company, 1968, pp. 255-267.

Questions:

1. Give two advantages of air transportation.
2. What are some of the disadvantages of air transportation?
3. What types of cargo are most suitable for air transportation?
4. To what does the term "stol-port" refer?
5. What is one method by which the air line industry is attempting to avoid air collisions?
6. How has satellite communications assisted the airlines in flights over oceans?
7. What is a flight simulator? How does this help provide for safer flights?
8. In millions of passengers carried, what per cent of growth has air passenger travel had between the years of 1952 and 1967?
9. What is the name of a major air line in or near your town?

10. How much capital is involved in the particular air line referred to in question nine above?

# SERVICE INDUSTRIES

There are two basic types of service industries: service to a product and service to people. Our primary concern is the service industries which deal with service to a product. In this broad classification, service industries are industries that support the processes of production or products of another industry. While a service industry does not manufacture a product, it may perform an operation on a manufactured item such as sharpen cutting edges, clean the product, install it or repair it so that it is usable again.

Since we are primarily concerned with the service to products industries, we will again break these down into two classifications which include the external service industries and the internal service industries. The internal service industries would include those services performed within a manufacturing industry in such areas as store rooms, stock rooms, machine shops, tool cribs and inspection areas. The service facilities perform the same functions that the external service industries perform; however, it is becoming the trend to hire or contract more of these services outside the plant. We will be concerned primarily with those external service industries which service the products. Some of these are listed below:

1. Laundry and dry cleaning
2. Appliance and electrical motor repair
3. Radio and TV repair
4. Tool and die repair
5. Automotive service
6. Farm equipment service
7. Small engine repair
8. Rental service agencies
9. Physical plant maintenance
10. Construction services

In the past, most of the service operations were performed by the original producer because of the fact that the products were hand crafted by him. Therefore, the necessity arose to return them to him for service. If for example, a wheel from a wagon was broken, it was returned to the smith or wheelwright who made the wagon. As industrialization progressed many early manufacturers relied on the services of the small shops to repair their manufactured products. Gradually these shops, such as blacksmiths, changed from a producing agent to a service center for manufactured goods. Some specialized companies repaired the product they manufactured and this is still true today in a few limited cases. Many companies contract their service work to other agencies even though the service is performed in the company's name.

Consumers are now putting about 41 cents of every dollar into the service industries. By 1970 it is estimated they will be spending over 50 cents of every dollar. Because of this projected estimate many individuals having service skills will be needed to fill this gap in the labor market. With this in mind, it is important that you as a student understand what the opportunities are in this type of industry--the service industry.

Assignments:

1. Look up and become familiar with the listed references.
2. List the services you can find in the yellow pages of the telephone book. Compose a list of services to products and a list of services to people.
3. Be prepared to discuss three products that your family has received service on in the past month.
4. Write a one-page paper on the history of a service you found in the yellow pages of your phone book.
5. Be prepared to discuss in front of the class a service which you think is important to your family.
6. Be prepared to discuss the study questions listed.

References:

1. Occupational Outlook Handbook, U. S. Government Printing Office.
2. Roscoe, Organization for Production, Richard Irwin, Inc., 1963.
3. "The Unknown Half of the Economy, Service Industries", Business World, pp. 190-192, September 21, 1957.
4. Yellow pages of any telephone book.

Questions:

1. How many basic types of services are there? What are they?
2. What is the difference between service to a product and service to people?
3. What are the two classifications included in the service of products?
4. Name three things you can get through a rental service.
5. Who were the first people classified as service men? What circumstances caused these people to become service men?
6. Can you name a product that would have to be repaired by the company who produced it?
7. Name at least three services a company would contract.
8. What per cent of the population is employed in the service industries?
9. What are some important checks concerning servicing that should be made by the consumer when purchasing products?
10. In what way are service industries dependent on manufacturing industries?

11. What kind of information does a service manual give?

12. Why do some service industries lend themselves to dishonest practices?

# SERVICE INDUSTRIES

## LAUNDRY AND DRY-CLEANING

In spite of the many mechanical devices available much hand labor still goes into the laundry and dry-cleaning business. In Rome as early as 720 B.C. the manner in which clothes were to be washed by public launderers was prescribed by law.

The growth of modern laundry practice owes much to the stiff detachable collar introduced in 1824. A manufacturer of such collars began a washing and ironing service for such in 1831.

In 1863 a belt-driven washer with reversing movement was patented in the U.S. by Hamilton Smith. Almost all subsequent designs of washing machines were merely improvements on this basic design. The expansion of power laundries in the U. S. after the Civil War was rapid. By the mid 1870's power equipment was standard equipment in commercial laundries in the U. S. and England.

Since World War I this industry has grown at a rapid pace. It was then that many women took factory jobs thereby sending out the family washing. During World War II the shortage of labor in the U. S. stimulated the development and growth of coin operated self-service laundry machines. To meet this competition commercial launderies opened "feeder" shops where washing was collected and distributed.

Dry-cleaning started as an industry during the 19th century in the period from 1825-1845. One of the early cleaning fluids was camphene, a substance from which turpentine is made. New solvents were developed as dry-cleaning grew to a recognized industry. These fluids were all inflammable however. Although carbon tetrachloride was not flammable its danger to the health of the individual has prevented its further use as a cleaning solvent. There are several different skills needed in the dry-cleaning industry.

Your study of the laundry and dry-cleaning industries should make you aware of many of the job opportunities in this area and the skills needed for such jobs.

Assignments:

1. Read the assigned references.
2. Make a list of commercial launderers in your neighborhood or city.
3. Interview the owner of a coin-operated laundry and find out what profit is made per year on each washer; also on each dryer.
4. Be prepared to discuss the study questions in class.

References:

1. Occupational Outlook Handbook, U. S. Department of Labor, 1968.
2. Encyclopedia Britanica, Vol. 13, 1965.

Questions:

1. What is the major difference between dry-cleaning and laundering?
2. What are the first two steps in the process of power laundering?
3. What happens to a material that is labeled "dry-clean only" when it is laundered in water and a detergent?
4. What is a dry tumbler?
5. What is a washer extractor?
6. Why has the cleaning industry discontinued the use of carbon tetrachloride as a cleaning solvent?

7. What is a spotter and why is this occupation such a highly skilled job?

8. What are some of the antique or ancient methods of laundering clothing?

9. What scientific principle is involved in the use of a detergent and hot water to wash cloth?

10. What happens to a woolen fabric when it is laundered in hot water? Why?

11. How are woolens washed and dried?

# SERVICE INDUSTRIES

## APPLIANCE AND ELECTRIC MOTOR REPAIR

With the increasing number of appliances and electric motors being used in the household it is necessary to have people available who can repair these items. Although many times it is only a minor repair job, the owner will take it to an appliance repairman because he does not want to bother with it or he does not know how to repair it and he cannot afford to buy a new appliance.

This area of the service industries is actually one of the best for the person who wants to go into business for himself or do this work on the side. This type of service is always in great demand, not only by individuals but by large companies who need skilled repairmen to service the products for their customers.

Many of the electrical appliances found in the household contain some type of electric motor. This means that a repairman must know something about electric motors as well as refrigeration, gas, and water appliance operation principles.

Assignments:

1. Read the assigned references.
2. If possible, interview an appliance repairman and ask him about his job.
3. Answer and be ready to discuss the listed study questions.

References:

1. Occupational Outlook Handbook, U. S. Department of Labor.
2. Ludwig, "Let's Be Realistic and Fair About Appliance Servicing", What's New In Home Economics, Association of Home Appliance Manufacturers, 20 North Wacker Drive, Chicago, Illinois.

Questions:

1. What is one of the most common repairs needed on small electrical appliances that most people could do if they wanted to repair the appliance?

2. In order to be an effective appliance repairman an individual should have a good working knowledge of what two things?

3. If you needed to repair an automatic washing machine what particular skills do you think you would need?

4. If you did not feel that you could repair an appliance, what should you do? Why?

5. What is an appliance repair warranty?

6. Most household appliances which operate on electricity have a U.L. tag or sticker placed somewhere on it. What does this sticker or tag represent?

7. How would you prepare yourself to become an appliance repairman?

8. How would you prepare yourself to become an electric motor repairman?

9. Where would you purchase replacement parts for an appliance which you wanted to repair?

10. What is a major disadvantage to most people attempting to repair their own household appliances?

# SERVICE INDUSTRIES

## RADIO AND TV REPAIR

With the ever increasing complex electronics products needing repair it becomes necessary for radio and television repairmen to constantly keep abreast of the various changes, improvements, and innovations in electronic circuits. In order to do this many repairmen attend short training programs conducted by trade organizations, manufacturers, and/or employers.

Repairing electronic equipment requires a certain amount of manipulative skill. It requires also a good background in electronics, some formal schooling in mathematics and physics and usually, some type of on-the-job training.

A study of the unit will reveal to you some of the aspects involved in employment, training qualifications, the earnings and working conditions of this particular service industry.

Assignments:

1. Read the references listed.
2. Be prepared to discuss the answers to the study questions listed.

References:

1. Occupational Outlook Handbook, U. S. Department of Labor, 1968, pp. 433-435.

Questions:

1. Radio and TV repairmen are classified as "inside and outside men". What does this mean?
2. Why would a color-blind person have difficulty doing electronic work?

3. What determines whether a repairman will repair the article in a shop or on the "spot", such as in a customer's home?

4. Are there any dangers in the occupation of repairing electronic devices?

5. Is it possible to apprentice in the radio and television industries? If so what are the apprenticeship requirements?

6. Is there a union for repairmen of radio and television equipment?

7. What do the letters AM and FM represent when you see them on electronic equipment?

8. What is the average work week in hours for the radio and television repairman?

9. If you wanted more information about this occupation, where could you look?

# SERVICE INDUSTRIES

## TOOL AND DIE MAKING

It would be virtually impossible for us to have many of the modern conveniences which we have today without the aid of the tool and die makers. It is this skilled service that develops the machines with which mass production of many products takes place.

The tool and die maker must have excellent basic shop experiences in metalworking, shop theory, and a well-rounded background in physics, mechanics, electricity, mathematics, drawing, and English.

Usually tool and die makers are thought of as makers of metal dies and tools for metal products. This is no longer true. This same person may be engaged in constructing a die cast for a product made of plastic, glass or some other material.

Assignments:

1. Read the assigned references.
2. Interview a tool and die maker to discover what is involved in his job.
3. Be prepared to discuss the study questions listed.

References:

1. Occupational Outlook Handbook, U. S. Department of Labor, 1968.

Questions:

1. What are jigs and fixtures?
2. Why is it necessary for a tool and die maker to have a good knowledge of several subjects such as physics and mathematics?

3. How does a tool and die maker achieve the skills necessary for his trade?

4. What are some machines with which a tool and die maker works?

5. What are three skills which tool and die makers use in their occupation that you might learn in an industrial arts course?

6. Do you believe it is necessary for a tool and die maker to have a good working knowledge of woodworking processes? Why?

7. Does a tool and die maker's occupation require him to be skilled in reading blueprints? Why?

8. What are some examples of the related information with which a tool and die maker should be acquainted?

9. Would an individual who has physical problems with his feet or legs have obstacles to overcome if he became a tool and die maker? Explain your answer.

10. What are the opportunities for employment in the area of tool and die making?

# SERVICE INDUSTRIES

## AUTOMOTIVE MAINTENANCE AND REPAIR

The servicing of an automobile may involve any number of skills or jobs ranging from a complete engine overhaul to wiping the windshields, checking the oil, and filling the fuel tank.

This service industry involves a large number of skills which at one time during the history of the early automobile one man could usually perform. Now it is rather difficult for one man to perform all of the services necessary to maintain the various automobiles manufactured.

Many people specialize in a particular phase of servicing the automobile such as brake and wheel aligning works, body and paint repairs and many other jobs. These individuals may work in a large automotive repair and service shop in a specialized area or they may set up a private business whereby they perform only the specialized work such as brake and wheel alignment.

In your study of this industry you should become aware of the many skills involved and the job opportunities available.

Assignments:

1. Read the assigned references.
2. Study and be prepared to answer the study questions listed.

References:

1. Occupational Outlook Handbook, U. S. Department of Labor, 1968.

Questions:

1. What is preventative maintenance?

2. How do most automobile mechanics learn the trade?

3. Why is there expected to be an increase in the number of automobile mechanics needed in the next two years?

4. What is a dynamometer?

5. What is a factory training center and what purpose does it serve the automobile mechanic in industry?

6. What is the difference between a mileage warranty and a time warranty on an automobile?

7. How has the government been concerned with replacement of repair parts on automobiles and warranty on parts? Why?

8. Why is it unwise to attempt to do much of your own automobile repair service?

9. What are some areas of work closely associated with the automobile repair and maintenance occupation?

10. In the operation of a service gasoline station, on what part of the business does the operator realize the largest profit?

# SERVICE INDUSTRIES

## FARM EQUIPMENT REPAIR

Farming is becoming more and more mechanized. Because of this there is an increasing demand for the farm equipment servicing. This type of work often involves going to the machinery or equipment and requires that the service personnel have a high degree of mechanical skill and an understanding of people and agriculture.

In this study you will come to know some of the skills and knowledge needed by those who service farm equipment.

### Assignments:

1. Read the listed references.
2. List five major problems with which farmers are faced in using and maintaining equipment.
3. Study the questions and be prepared to discuss them in class.

### References:

1. Occupational Outlook Handbook, U. S. Department of Labor, 1968.

### Questions:

1. What is a self-propelled machine?
2. What is a compression feeder and how does it work?
3. Why should the person in this particular equipment servicing occupation have a knowledge of agriculture?

4. Is apprentice training available for this type of service work?

5. Why is it necessary for the farm equipment serviceman to have a good understanding of people?

6. Could an individual who is highly skilled in repairing any type of machinery or equipment and who has lived in the city all of his life make a success in servicing farm equipment?

7. Are most pieces of farm machinery sold with warranties? Why?

8. How does the occupation of a farm machinery serviceman compare to that of an automobile serviceman? How do the two occupations differ?

9. Is the farm machinery servicing occupation strictly a seasonal job? Why?

10. What are some of the opportunities in the area of farm machine servicing?

# SERVICE INDUSTRIES

## SMALL ENGINE REPAIR

Small engine repair is beginning to increase as a result of more people using small engines to substitute for muscle power. Often the repairs needed on small engines are minor and take little time, but this type of repair work requires some special skills and tools which many people do not have.

Some of the uses to which various small engines are put include: motor boats, mobile sleds, bicycles, lawn mowers, chain saws, electric power generators and welders, hedge trimmers, paint sprayers, and portable circular saws.

In this study of small engine servicing you should become aware of the many types of small engines available and become acquainted with some of the skills needed in this industry.

Assignment:

1. Read the listed references.
2. Make a list of items, tools, and machines found in the home and industry that utilize small engines.
3. Answer the study questions and be prepared to discuss them in class.

References:

1. The Two Cycle Engine, Service Department McCulloch Corporation, Los Angeles, California.
2. General Theories of Operation, Briggs and Stratton Corporation, Milwaukee, Wisconsin.
3. Engine Principles of Operation and Assembly, I.I. Series No. EN-1, Kohler Company, Kohler, Wisconsin.

Questions:

1. What special skill or skills are needed to repair small gasoline engines?

2. What are the principle differences between the four cycle and two cycle small gasoline engine?

3. What are the advantages and disadvantages of the two cycle engine and four cycle engines?

4. What is meant by the term "magneto"?

5. What is the difference between a motor and an engine?

6. Are there any special safety precautions that should be taken when working with small internal combustion engines?

7. Are the training and skills which are needed in servicing small engines different from those required in servicing automotive engines?

8. What is the employment outlook in the area of small engine repair?

# SERVICE INDUSTRIES

## RENTAL SERVICE AGENCIES

The rental service is a relative newcomer to the service industries. The rental services vary greatly in size and in the variety of products rented. Items carried by rental operations are divided into two categories: (1) soft goods--party equipment and hospital supplies, and (2) hard goods--tools ranging from hedge trimmers to cranes. Rental agencies of all kinds have one thing in common--they all service the items they rent.

Since the rental service agencies are part of the service industries, the future looks prosperous for rental agencies. This unit should help you to become acquainted with this particular area of the service industries.

Assignments:

1. Read the listed references.
2. Read the article "Thriving In Business Without Any Sales" (Information Assignment Sheet #15-15).
3. Write the answers to the listed questions taken from the above reading and be prepared to discuss them in class.

References:

1. "Thriving In Business Without Any Sales", Business Week, March 23, 1963.
2. "Expanding Service From Autos To Funerals", Business Week, April 16, 1966.

Questions:

1. What happens at the annual trade show of the American Rental Association?

2. What do the rental agencies do with their rental items which are no longer usable from the standpoint of renting?

3. What is meant by dealer price?

4. How does a manufacturer relate quality control of a product to the rental agencies?

5. What are some of the major problems involved in conducting a rental service business? How are these problems overcome?

6. How are charges established for rental of different items?

7. What is the major expense involved in establishing a rental agency?

8. What advantage would an appliance and machine serviceman have in becoming an owner of a rental agency?

# SERVICE INDUSTRIES

## PHYSICAL PLANT MAINTENANCE

Physical plant maintenance is a very important aspect of industry. As the term implies, maintenance of any plant is the act of maintaining it in working order and/or condition at all times. Whether the plant is a large industrial one or a large group of school buildings, it involves the servicing of equipment, interior and exterior areas of the plant, power plants, electrical equipment and other components which are vital to the proper operation of the plant.

Much maintenance is planned, although some is only done as it becomes necessary or when conditions cause a maintenance emergency to arise. A study of this material will help you to get a better picture of some of the responsibilities inherent in maintaining a physical plant.

Assignments:

1. Read the listed references.
2. Conduct an interview of your local school custodian or some plant maintenance man and make a list of his responsibilities.
3. Make a list of all of the skills which you feel this person (refer to problem 2 above) needs in order to fulfill his responsibilities.
4. Determine the answers to the listed questions and be ready to discuss them in class.

References:

1. Bethel, Industrial Organization and Management, McGraw-Hill Book Company, 1962, pp. 342-359.
2. Roscoe, Organization for Production, Richard Irwin, Inc., 1963.

3. Schuler, "You Can Cut Your Upkeep Costs", Nations Business, May 1964, pp. 94-96.

Questions:

1. What are the job opportunities present in the physical plant maintenance service industries?
2. What is meant by planned maintenance? Why is it so important?
3. What are some of the major maintenance skills needed by physical plant maintenance personnel?
4. How does a physical plant engineer's job relate to that of a physical plant maintenance person?
5. What is meant by the "down-time" of an item of production equipment for servicing?
6. Is there really any need to keep track of maintenance done on equipment used in your school or shops? Why?
7. How would you suggest that a check of the equipment in your school shop be made in order to provide for proper maintenance of the equipment?

# SERVICE INDUSTRIES

## CONSTRUCTION ACTIVITIES

Previously you have studied the construction manufacturing industry which involves the manufacturing of such products as highways, bridges, dams, buildings, and other such structures through construction. Once these structural products have been manufactured, they must be maintained continuously by personnel in the construction services industry. This unit is concerned with the services provided by such construction personnel.

As examples of a construction service upon a product we may examine the occupations involved in maintaining highways, bridges, dams, buildings, or other such structures. A wide range of skills are needed by many people engaged in a variety of occupations to accomplish the task of providing such services.

The plumber, electrician, carpenter, welder, or other skilled craftsman who assist in the construction manufacturing of a new structure use these same skills in maintaining and repairing by providing their construction services.

Your study of the construction service in this unit as opposed to manufacturing construction will provide you with an understanding of various construction skills needed to provide services to products manufactured through construction activities.

Assignments:

1. Read the listed references.
2. Look over the house in which you live and make a list of items, such as walls, plumbing, heating, and woodwork items which might need repairing or maintaining.
3. Using the list above, identify the occupational titles of the individuals whom you would contact to make the necessary repairs or maintain your house.

4. Make a list of some of the skills which you would need if you went into business for yourself to provide an "odd jobs" construction service to people.

5. Make a list of organizations which have direct influences upon the occupations in the construction services industry. Explain why such organizations exert such an influence.

References:

1. Cooke, Marvels of American Industry, C. S. Hammond and Company, 1962, pp. 89-101.

2. Gerbracht and Robinson, Understanding America's Industries, McKnight and McKnight Publishing Company, 1962.

3. Occupational Outlook Handbook, U. S. Department of Labor, 1968, pp. 318-365.

Questions:

1. On what parts of a structure does a finish carpenter work? What particular skills are needed for this type of work?

2. What does a steamfitter do, and how does his job differ from that of a plumber?

3. In repairing or replacing electrical apparatus and wiring in a structure electricians are required to follow a "code". What is this code and why does it have to be followed?

4. What particular problems can you see that would be involved in repairing a large dam?

5. What are the differences which exist in the classification of a "common laborer" and a skilled craftsman such as an electrician?

6. Can a "common laborer" work as a carpenter, welder, or at any of the other trades and earn the same wages as they? Explain your answer.

7. What restrictions, rules, or regulations, if any, must be taken into consideration before a house is to be built in an undeveloped part of a city or town?

8. What are the titles of some of the individuals concerned with the planning for and construction of such a house referred to in question 7 above?

9. What type of work does a steelworker actually do? If there are hazards in this trade, name some of them.

10. What are some of the occupations involved in the construction of a highway or turnpike?